bryozoa colonies are usually complete, unless broken during dredging operations.

The bryozoan individual is always small, being rarely half as large as a pin head, but the colonial mass is often of sufficient size to render them desirable as food for numerous organisms, were it not for the fact that in nearly all cases they are well protected by heavy chitinous or calcareous walls. Only those animals provided with strong incisorial teeth or which can swallow the colony whole, can utilize them. Predaceous worms and other invertebrates probably are unable to feed on them to any extent, for in addition to its shell, the bryozoan is so highly irritable to tactile stimuli that it retracts into its shell with great rapidity at the slightest touch. Possibly some of the softer-bodied ctenostomes may serve as food for other invertebrates, but observations on this point are apparently lacking.

It should be added that the statoblasts of the freshwater bryozoa are often eaten by young fishes. During a survey of the fishes of Ohio, made during the past summer, statoblasts of *Pectinatella* and *Plumatella* were found among the stomach contents of the young of the large-mouth black bass, *Micropterus salmoides,* the crappie, *Pomoxis annularis,* the blue-gill sunfish, *Lepomis pallidus* and the gizzard shad, *Dorosoma cepedianum.* That these were picked up for food among other organisms of the same size there can be little doubt.

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COPPER IN ANIMALS AND PLANTS

IN a recent number of *The Journal of Biological Chemistry* (Vol. 44, pp. 99–112, Oct., 1920) W. C. Rose and M. Bodansky report the finding of copper in various marine organisms, including Coelenterates, Mollusca, Crustacea, Elasmobranchs, and Teleostomi. As some of the writer's work bears on this subject, the following note is offered.

In some recent investigations on the respiration of insects the writer incinerated both the blood and entire specimens of over 30 species of insects, representing the chief orders. The ash was analyzed for copper, on the supposition that the copper present serves as the nucleus of a respiratory pigment, namely hemocyanin. In every case the ash reacted positively for copper with several reagents. The amount of copper present in insect blood is nearly proportionate to that present in crayfish blood, which was used as a control.

In addition to insects and crayfish, other Arthropods were incinerated, including several species of plankton Crustacea, spiders, daddy long-legs, and centipeds. In all cases copper was found. As representatives of other phyla *Volvox, Lumbricus, Ascaris,* snails and slugs, and the blood of garter snakes and human blood were incinerated. Of these all but the vertebrate blood reacted positively to tests for copper. As a matter of fact, the snake blood also appeared to show a minute trace of copper, but as the reaction developed with only one of the reagents used, and then only after several hours under alcohol vapor, this particular experiment is inconclusive.

The foregoing results indicate that the element copper has a wider distribution in living organisms than heretofore accepted. Its function has been definitely determined only for mollusks and Crustacea, where it forms the nucleus of a respiratory protein. Its presence in other Arthropods is explained on the same basis, that is, in all Arthropods copper forms the nucleus of hemocyanin. This is all the more probable, since, as already stated, the amounts present in insect blood, spiders and centipeds are proportionate to the amounts present in the crayfish blood used as a control.

In considering the source of the copper the writer analyzed the water of a creek from which most of his aquatic material was taken, and found distinct traces of the metal. The water as a source of copper is of importance to aquatic animals. It was shown, however, that terrestrial insects, including such highly specialized families as bees, ants and wasps, contained copper. These and other terrestrial insects, especially the herbivores, could derive

their copper only from their plant food. In view of this fact about a dozen species of plants were incinerated. In all cases, whether the portion incinerated was taken from the stem, or the leaves, or fruit, the ash reacted positively.

In general, copper was present only in traces in plants, not at all in amounts comparable to that present in insects. It is probable that the copper ion is inactive in plants, that its presence is due to mechanical storage, and that it plays no active rôle in the physiology of the plant.

It is evident, however, from the experiments performed, that copper is widely distributed in both the plant and animal world. In the former it is present only in traces, and probably inactive, while in the latter it is present in measurable quantities and its rôle appears to be active.

A more detailed account of these investigations will be published in the near future.

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SCIENTIFIC EVENTS

DIRECTORS OF RESEARCH AND SCIENTIFIC QUALIFICATIONS

The Right Hon. F. D. Acland recently asked in the House of Commons, as we learn from *Nature*, whether the lord president of the council "is aware that dissatisfaction is being expressed by scientific workers with the appointment of a man without scientific qualifications as director of research to the Glass Research Association; whether, as the Department of Scientific and Industrial Research provides four fifths of the funds of the association, the department was consulted before the appointment was made; and does he approve of the appointment as giving a guarantee that state funds devoted to scientific research will be wisely expended?" Mr. Fisher replied to the question, and his answer included the following statements, which concerned a director for the work called from the United States: (1) The successful candidate has a wide and successful experience of scientific research into the problems of the glass industry, and is considered by the association to be the man best suited for organizing and directing the research needed by it. (2) The responsibility for the selection of a director of research rests in each case with the research association concerned, and not with the Department of Scientific and Industrial Research, which has no power to approve or disapprove the appointment of any individual. (3) The department guarantees three quarters of the expenditure of the research association up to a certain limit, but payment of the grant is conditional, among other things, on the approval by the department of the program of research and of the estimate of expenditure thereon. (4) The advisory council of the department, after considering all the relevant circumstances with great care, recommended the approval of the expenditure involved in this director's appointment.

ELECTIONS BY THE NATIONAL ACADEMY OF SCIENCES

The scientific program of the meeting of the National Academy of Sciences, held in Washington on April 25, 26 and 27, has been printed in Science, and other information concerning the meeting will be published later.

At the business session of April 27, the president of the academy, Dr. Charles D. Walcott, presented his resignation, but at the earnest request of the academy, he consented to serve the remaining two years of his term. The resignation of the foreign secretary, Dr. George E. Hale, was accepted with regret, and with the expression of high appreciation of his able work in that office. Dr. R. A. Millikan was elected foreign secretary, to complete the unexpired term of Dr. Hale. Dr. Hale was elected a member of the council, and Dr. Raymond Pearl was reelected.

The following were elected to membership:

Frank Michler Chapman, American Museum of Natural History.
William LeRoy Emmet, General Electric Company, Schenectady, N. Y.
William Draper Harkins, University of Chicago.
Ales Hrdlicka, United States National Museum.